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Guillot

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(54) **BELT TENSIONER**

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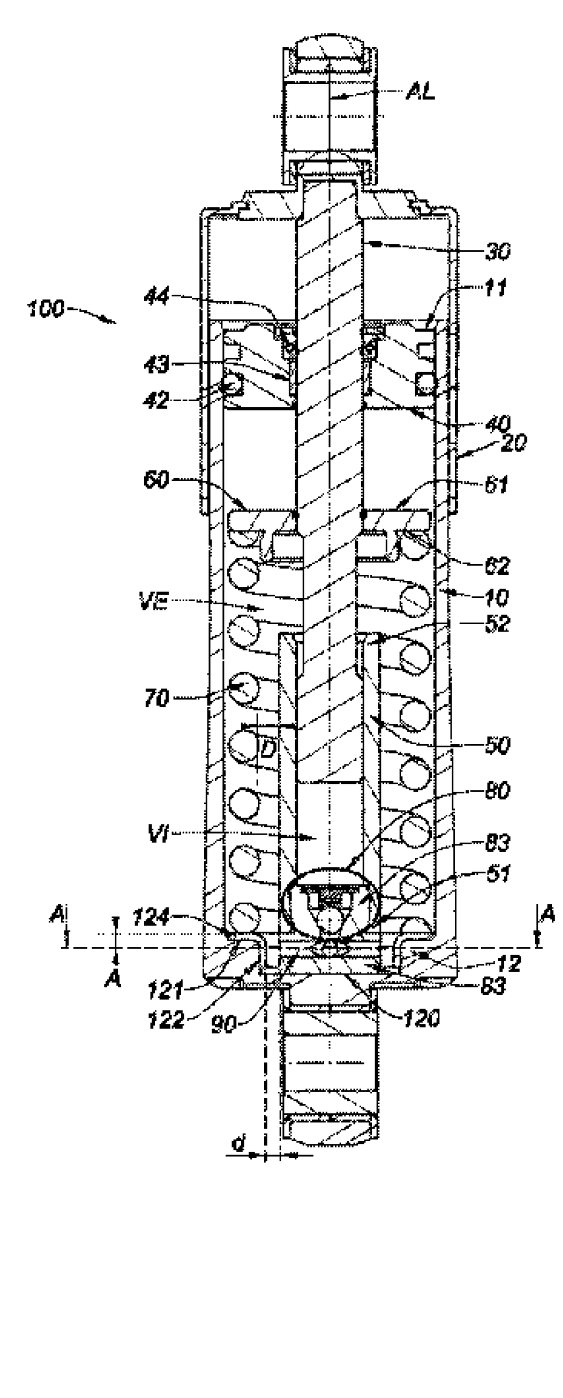
(57) **ABSTRACT**

The invention relates to a tensioner (**100**) comprising:
- a hollow body (**10**) provided with a bottom (**12**), said bottom comprising a central zone (**120**), a peripheral zone (**121**) raised relative to the central zone and an intermediate zone (**122**)
- an axis (**30**)
- two guide means (**40**, **50**) for said axis
- two cups (**60**, **124**), the cup (**124**) comprising a first portion (**124**A) in front of the peripheral zone and a second portion (**124**B) in front of the intermediate zone
- a spring (**70**) held between the cups and arranged around the second guide means so that there is a gap between the spring and the second guide means
- a valve (**80**) with a channel (**90**), the channel opening in front of the second portion of the cup (**124**) away from said second portion.

13 Claims, 8 Drawing Sheets



(52) **U.S. Cl.**
CPC *F16H 2007/0806* (2013.01); *F16H 2007/0812* (2013.01); *F16H 2007/0859* (2013.01); *F16H 2007/0891* (2013.01); *F16H 2007/0895* (2013.01); *F16H 2007/0897* (2013.01)

(58) **Field of Classification Search**
CPC F16H 2007/0814; F16H 2007/0859; F16H 2007/0891; F16H 2007/0895; F16H 2007/0897; F16H 7/0848; F16H 7/0836; F16H 7/1236
USPC 474/110
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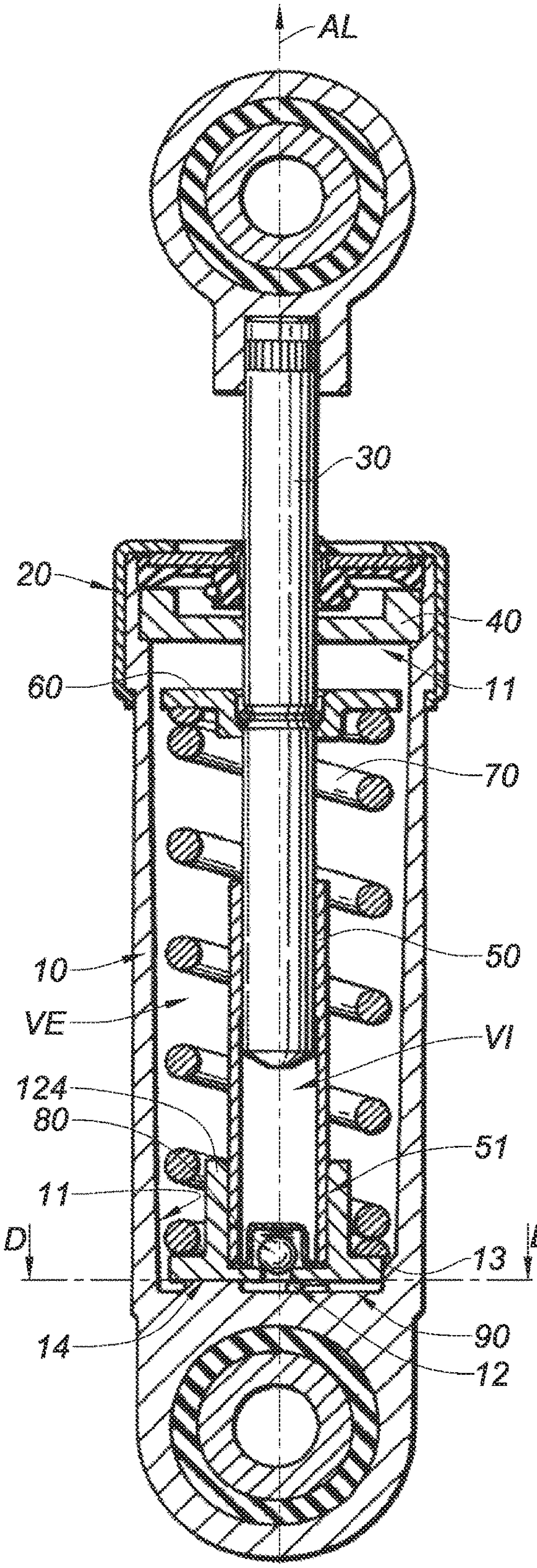


Fig. 1(a)

(Prior Art)

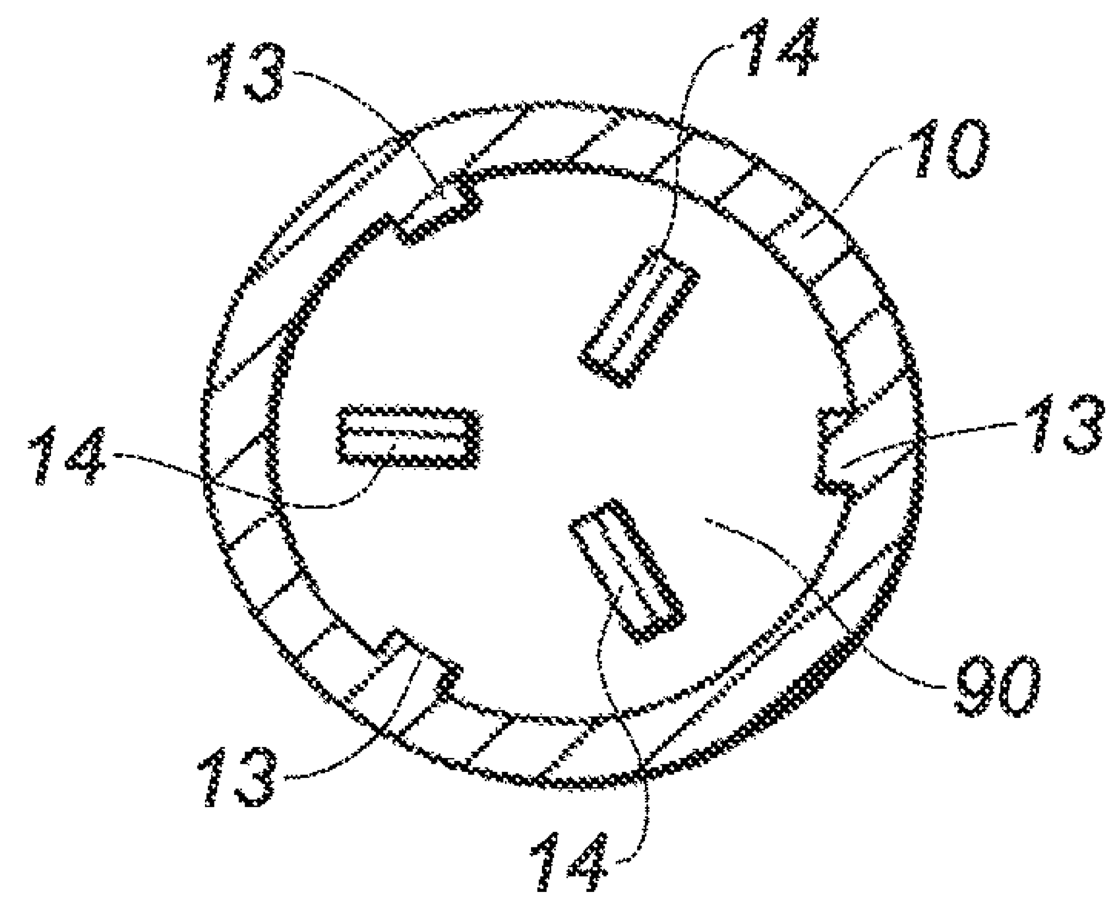


Fig. 1b
(Prior Art)
Coupe D-D

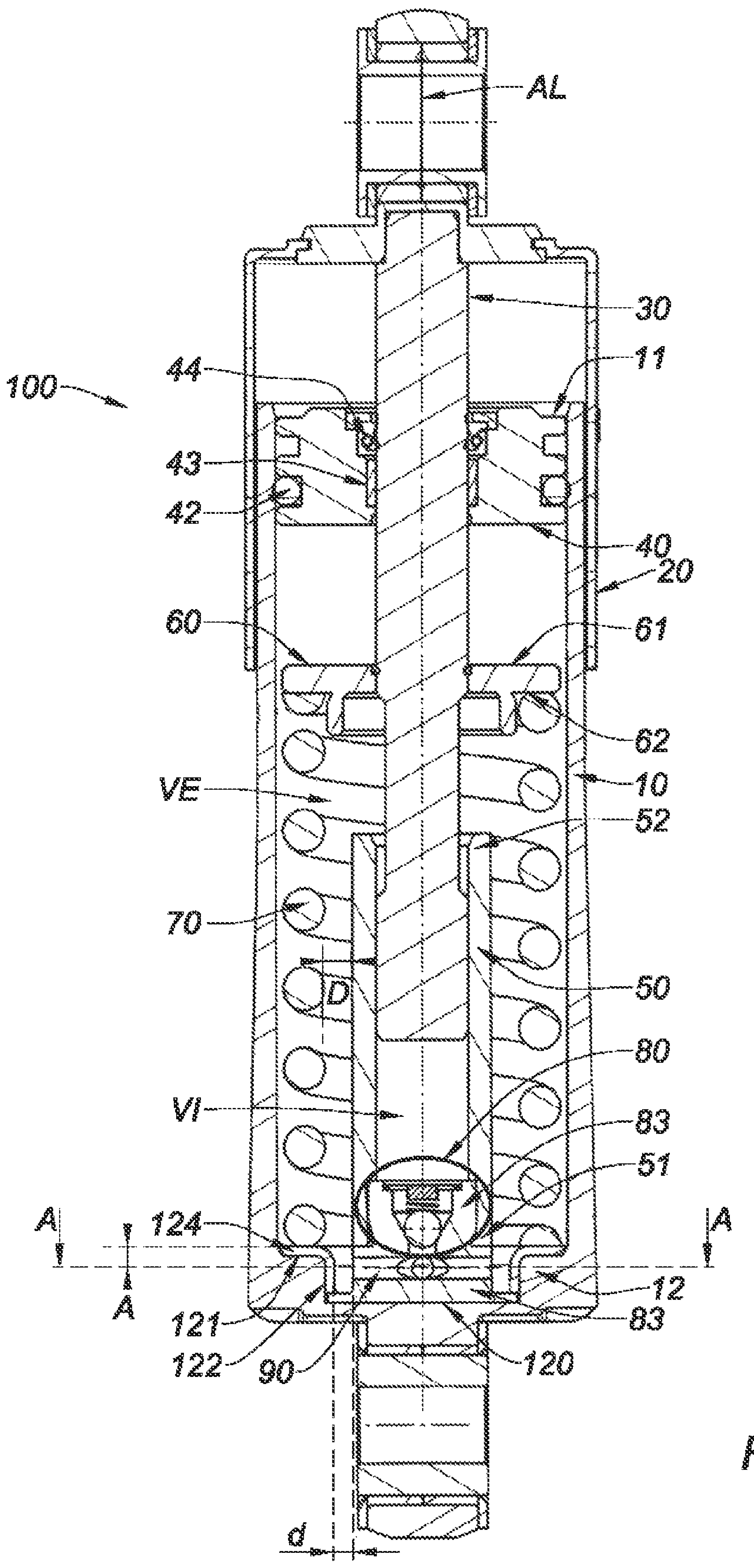
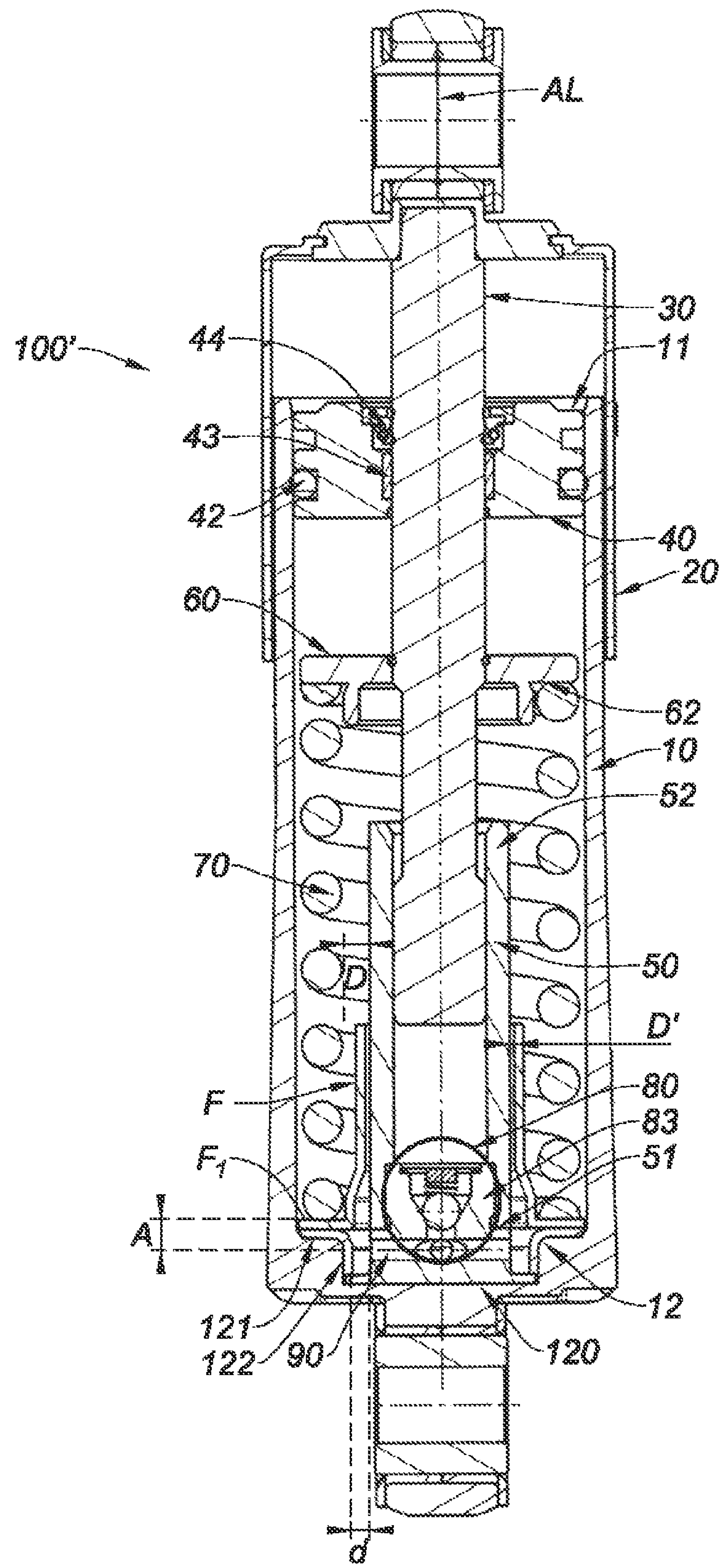

AL
30
11
100
44
43
42
40
20
60
61
62
VE
10
52
70
50
D
80
VI
83
51
A
124
A
12
A
121
83
122
90
120
d

Fig. 2



AL
100'
44
30
11
43
42
40
20
60
62
10
52
70
50
D
D'
F
80
83
F1
51
A
121
12
122
90
120
d

Fig. 3

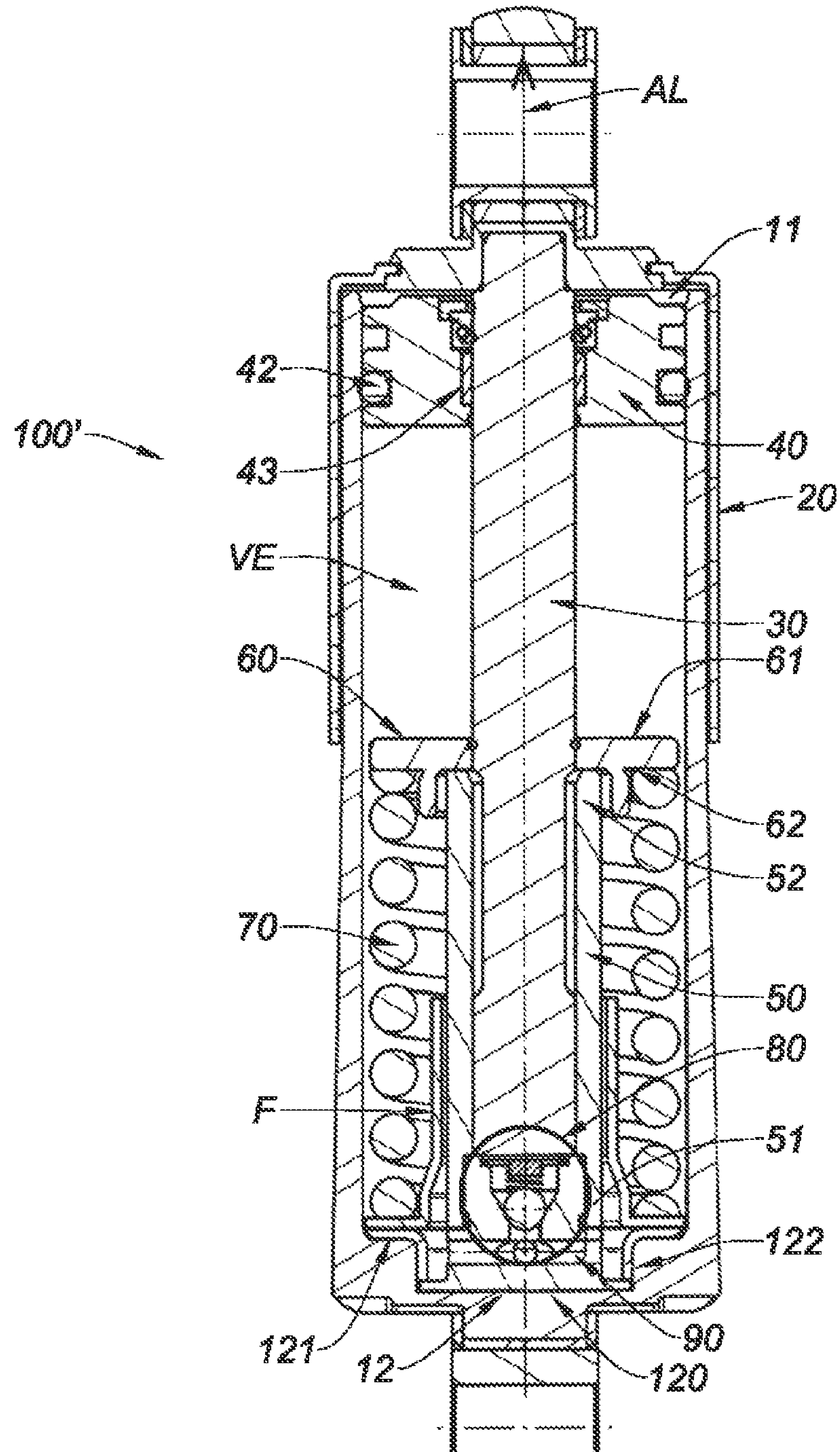


Fig. 4(a)

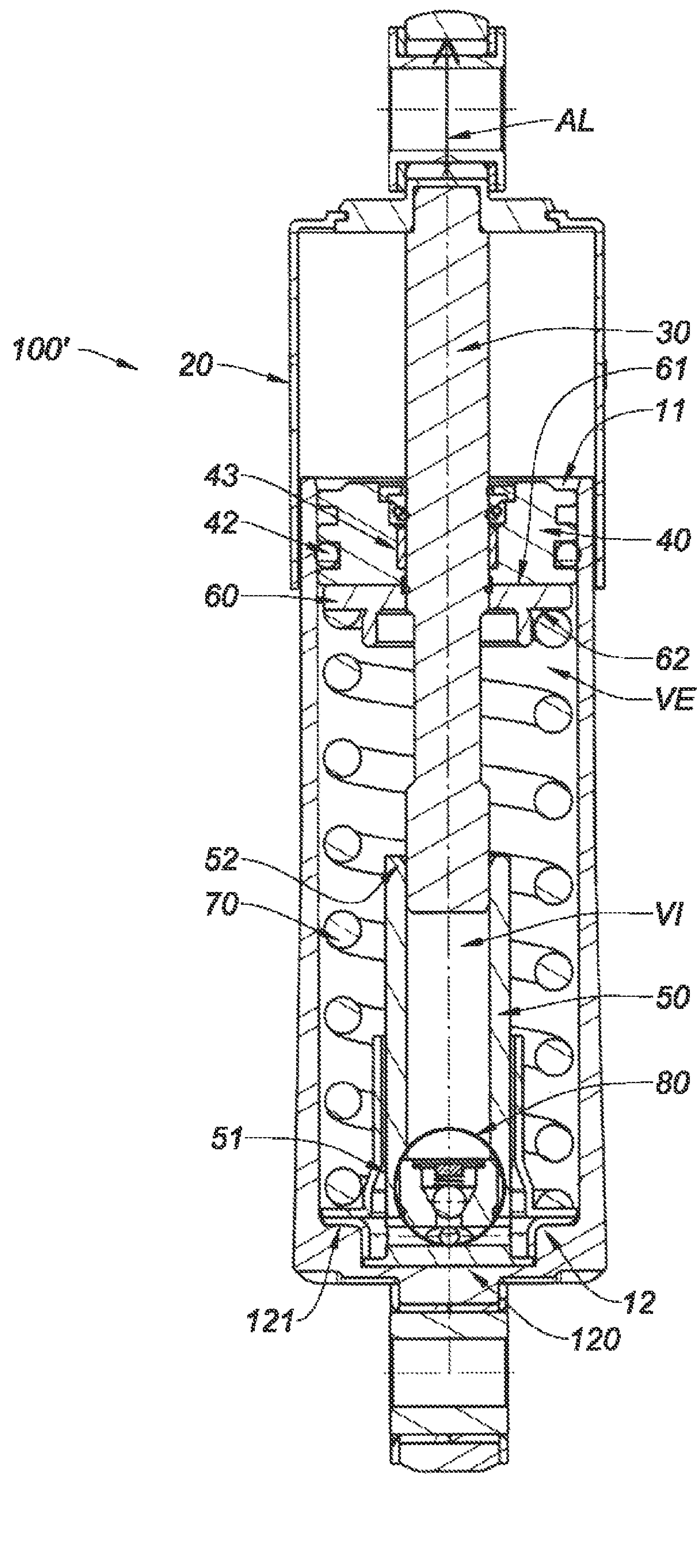


Fig. 4(b)

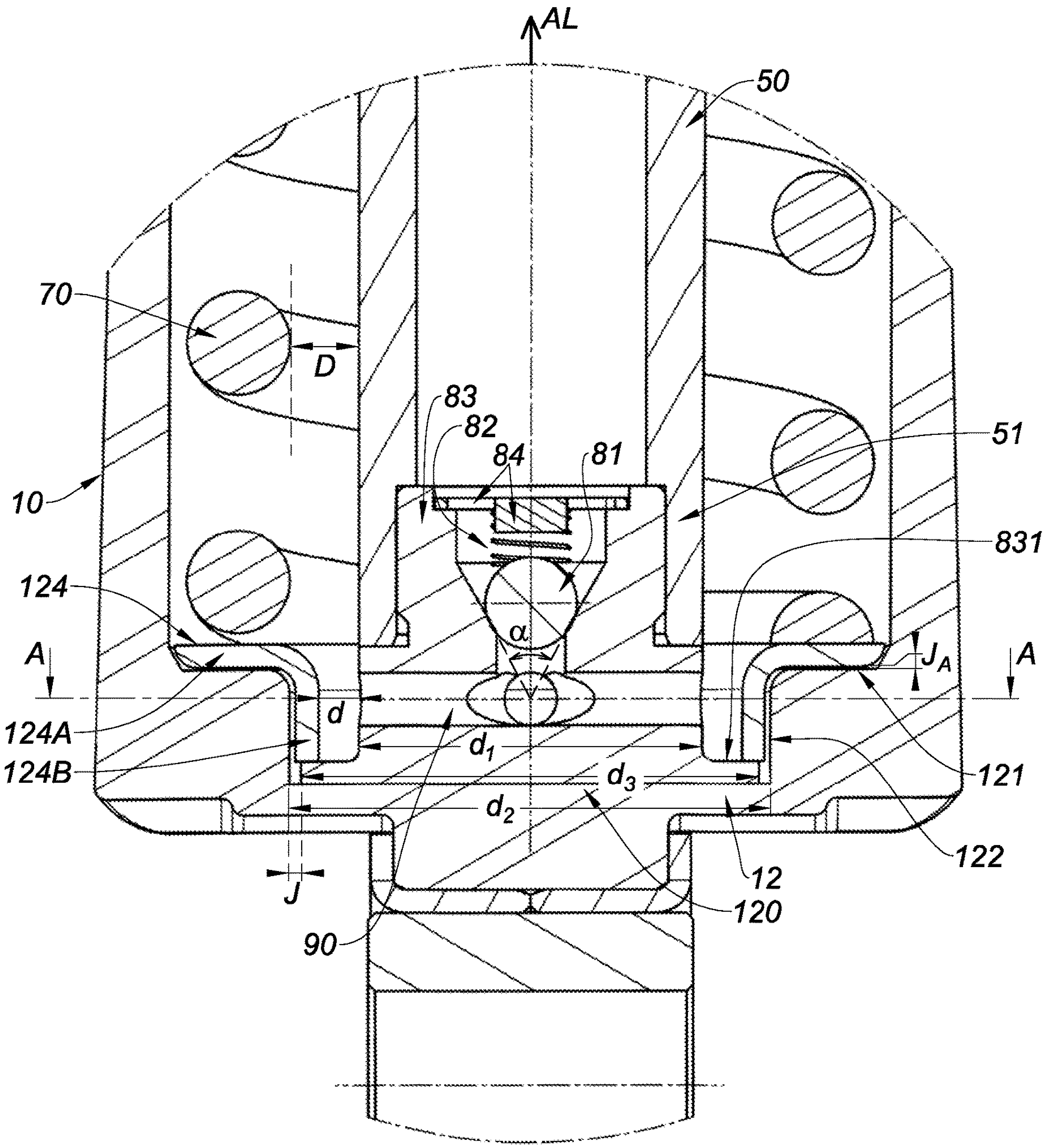

AL
50
70
D
10
83
82
84
81
51
831
124
A
A
J
A
124A
d
d
1
124B
d
3
121
d
2
122
12
J
120
90
α

Fig. 5

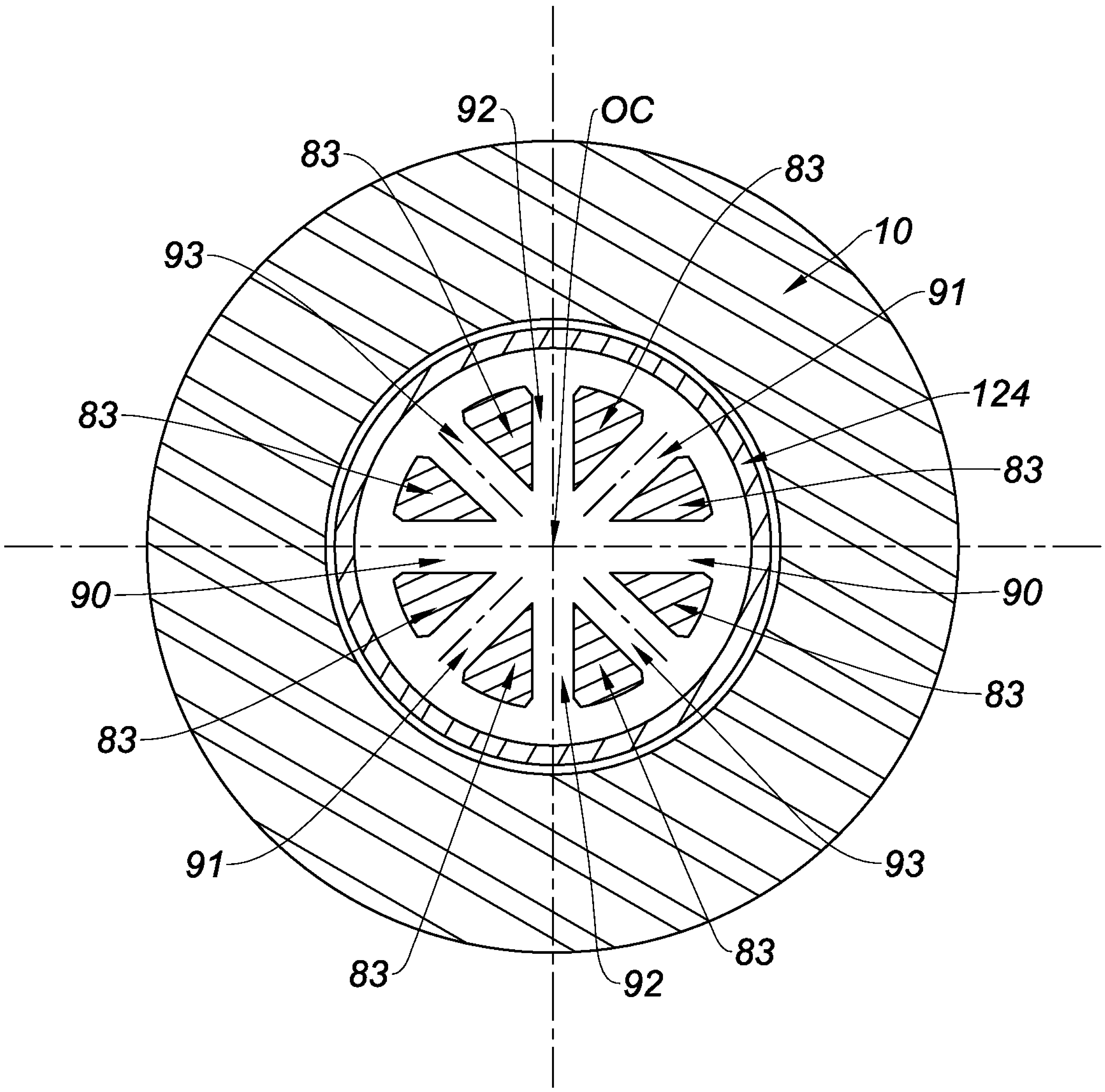


Fig. 6
(Coupe A-A)

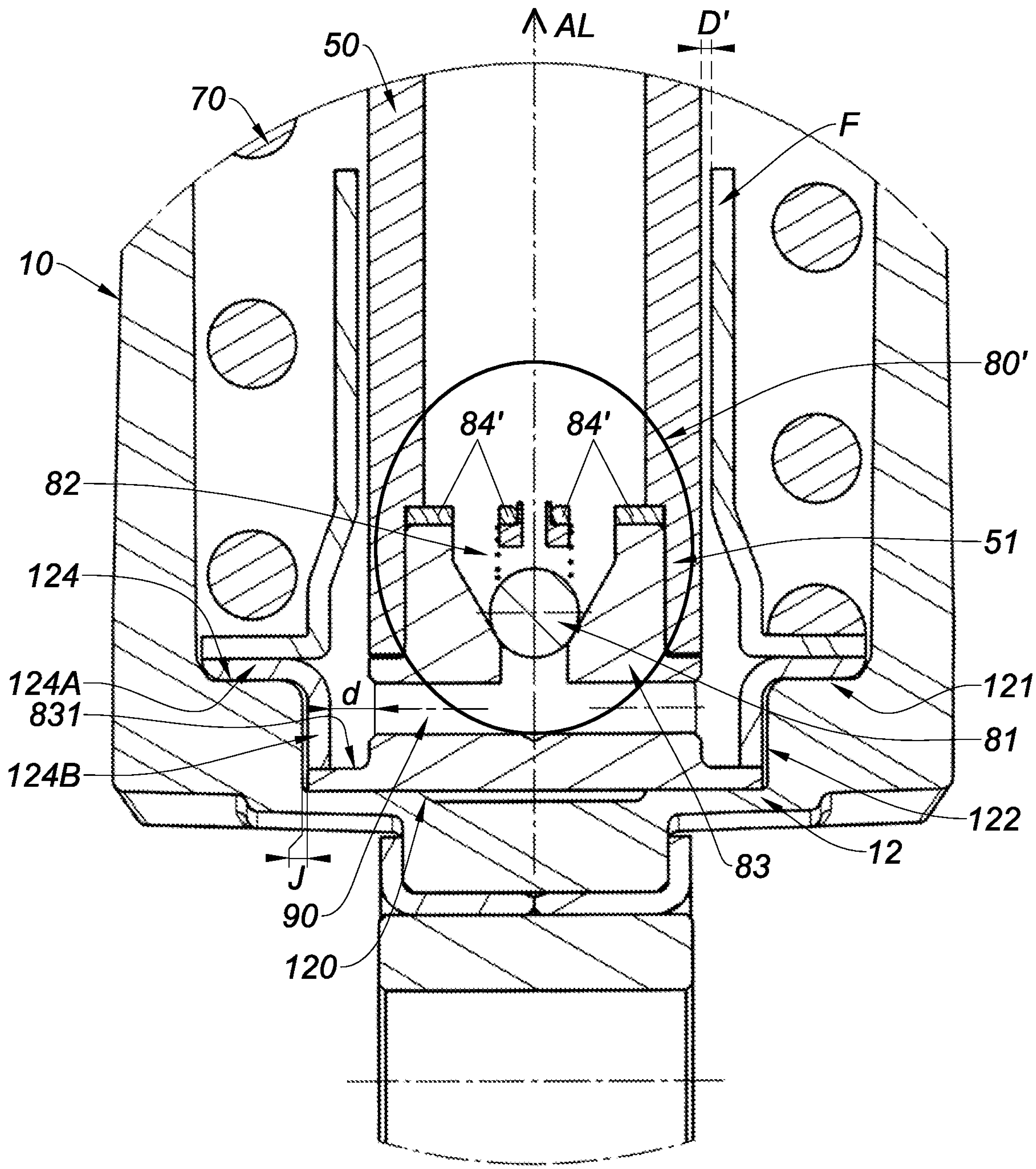

AL
D'
50
70
F
10
80'
84'
84'
82
51
124
124A
121
d
831
81
124B
122
12
83
J
90
120

Fig. 7

BELT TENSIONER

CROSS-REFERENCE TO RELATED APPLICATION(S)

This application is a National Phase Patent Application of International Application Number PCT/FR2018/050357, filed on Feb. 14, 2018, which claims priority to French Patent Application Number 1751196, filed on Feb. 14, 2017, the entire contents of both of which are incorporated herein by reference.

The invention relates to a belt tensioner.

A tensioner of this type can in particular be found in the automotive field.

Such a tensioner is, for example, proposed in the document U.S. Pat. No. 5,967,923 (D1).

The tensioner proposed in this document is reproduced in FIG. **1**, which comprises FIGS. **1**(*a*) and **1**(*b*).

FIG. **1**(*a*) is a longitudinal sectional view of the tensioner and FIG. **1**(*b*) a view of section D-D of FIG. **1**(*a*).

This tensioner **100** is provided with a longitudinal axis AL. It comprises a hollow body **10** provided with an opening **11** and a bottom **12**, the hollow body comprising a fluid. It also comprises a sleeve **20** arranged around the hollow body **10** and an axis **30**.

This tensioner provides a first guide means **40** for said axis **30**, this first guide means being attached to the hollow body **10** at the opening thereof.

It also comprises a second guide means **50** for said axis **30**, this second guide means being in the form of a tube **50** that defines an inner volume VI wherein said axis **30** is intended to move and an outer volume VE that is outside said tube (**50**) within the hollow body **10**. The end **51** (lower end) of the tube **50** is fixedly mounted (forcibly mounted) in a cup **124**, the latter being placed on the bottom **12** of the hollow body **10** and more precisely on axial protrusions **14** projecting from the bottom **12**. The cup **124** is furthermore held radially by other, radial and peripheral, protrusions **13** belonging to the hollow body **10**.

This tensioner also comprises another cup **60** fixedly mounted on said axis **30** between the first **40** and second **50** guide means of said axis **30**. It also comprises an elastic return means **70** arranged around the tube **50** so that there is a non-zero distance, taken radially, between the elastic return means **70** and the tube **50**. The elastic return means **70** is held between the two cups **60**, **124**.

The tensioner finally comprises a valve **80** mounted at the lower end **51** of the tube **50**, with which valve a fluid communication passage **90** is associated to allow the passage of a fluid contained in the hollow body **10** between the outer volume VE of the tube **50** and the inner volume VI that is inside said tube **50** (expansion).

The double guidance of the axis **30** proposed in this document makes it possible to hold the axis **30** along the longitudinal axis AL of the tensioner during the movements (expansion or compression of the tensioner) of the axis **30** in the tube **50**.

This is useful for ensuring optimal operation of the tensioner.

However, with the design proposed in this document D1, the fluid capable of passing from the outer volume VE to the inner volume VI flows between the elastic return means **70** and the inner wall **11** of the hollow body **10**, at the risk of being disturbed by the presence of the elastic return means (obstacle).

The flow is then disturbed and does not allow the operation of the tensioner to be optimised.

An object of the invention is to provide a belt tensioner with optimised operation, both during expansion and compression.

For this purpose, the invention proposes a tensioner with a longitudinal axis, comprising:

- a hollow body provided with an opening and a bottom, the hollow body comprising a fluid;
- a sleeve arranged around the hollow body,
- an axis,
- a first guide means for said axis, this first guide means being attached to the hollow body at the opening thereof;
- a second guide means for said axis, this second guide means being in the form of a tube that defines an inner volume wherein said axis is intended to move and a volume that is outside said second guide means within the hollow body;
- a first cup fixedly mounted on said axis between the first and second guide means of said axis;
- a second cup mounted at the bottom;
- an elastic return means arranged around the second guide means so that there is a non-zero distance, taken radially, between the elastic return means and the second guide means, said elastic return means being held between the first cup and the second cup;
- a valve comprising a seat mounted between one end of the second guide means and the bottom of the hollow body, with which valve at least one fluid communication channel is associated to allow the passage of a fluid contained in the hollow body between the outer volume of the second guide means and the inner volume that is inside said second guide means, without which:
- said bottom comprises a central zone, a peripheral zone that is raised relative to the central zone and an intermediate zone connecting the central zone to the peripheral zone;
- the first cup comprises a first portion in front of the peripheral zone and a second portion that is in front of the intermediate zone and in contact with a base of the seat, this base itself being in contact with the central zone;
- the elastic return means is designed to bear on the first portion of the first cup;
- said at least one fluid communication channel is arranged to open in front of the second portion of the first cup at a non-zero distance from this second portion, this arrangement allowing a fluid region of the hollow body to be defined around the second guide means up to said at least communication channel, said fluid region being free of any obstacle.

The tensioner according to the invention may also have at least one of the following features, alone or in combination:

- the sleeve is movably mounted relative to the body and the axis is fixedly mounted relative to the sleeve;
- the tensioner comprises a sheath, one end of which is in contact with the first portion of the first cup, the elastic return means then bearing on this end of the sheath, the sheath being furthermore arranged around the second guide means between the elastic return means and the second guide means at a non-zero distance, taken radially, from the second guide means, so that said fluid region of the hollow body that is free of any obstacle is defined between the sheath and the second guide means up to said at least one fluid communication channel;
- the elastic return means is a helical spring;
- the base of the seat has a dimension, taken radially, that is strictly smaller than the dimension, also taken radi-

ally, of the central zone of the bottom of the hollow body, so that there is a clearance between the seat and the intermediate zone;

the valve further comprises a dedicated elastic return means that is fixed relative to the seat; and a closure member that is attached to the dedicated elastic return means and rests on the base;

the closure member has a mass of between 50 mg and 700 mg and wherein the dedicated elastic return means is designed to apply a preload of between 0.05 N and 0.4 N in a direction so as to push the closure member against the seat;

the dedicated elastic return means has a stiffness k of between 30 N.m. and 80 N.m.;

the valve comprises a stop arranged to control the travel of the closure member;

the travel of the closure member is between 0.3 mm and 2.5 mm;

the closure member being a ball, the seat comprises a frustoconical inner portion for cooperating with the ball, this frustoconical inner portion being defined by an angle of between 30° and 90°;

the fluid contained in the hollow body is an oil;

the oil has a grade defined between the ISO VG5 standard and the ISO VG150 standard, these standards being defined by a kinematic viscosity according to the ISO 3448 standard.

The invention will be better understood and other aims, advantages and features thereof will become clearer on reading the description which follows and which is made with reference to the following appended figures:

FIG. **2** shows a tensioner according to the invention, in a longitudinal sectional view;

FIG. **3** shows an embodiment variant of the tensioner according to the invention shown in FIG. **2**;

FIG. **4**, which comprises FIGS. **4**(*a*) and **4**(*b*), shows the tensioner of FIG. **3**, in two extreme positions;

FIG. **5** is an enlarged view of FIG. **1**, at the lower portion;

FIG. **6** is a view of FIG. **1** according to section A-A;

FIG. **7** shows an embodiment variant of a valve used in a tensioner according to the invention.

A first embodiment of a tensioner **100** according to the invention is shown by FIG. **2**.

More precisely, FIG. **2** is a longitudinal sectional view of this tensioner **100**, in the middle position.

The tensioner **100** comprises a hollow body **10** that is provided with an opening **11** and a bottom **12** and a sleeve **20** arranged around the hollow body **10**.

The tensioner **100** also comprises an axis **30**.

In the case shown in FIG. **2**, the sleeve **20** is movably mounted relative to the body **10** and the axis **30** is fixedly mounted relative to the sleeve **20**. However, it could be otherwise, that is, the sleeve **20** could be fixedly mounted on the hollow body **10** and the axis movably mounted relative to the sleeve **20**, as is for example the case in document D1.

The tensioner **100** also comprises a first guide means **40** for said axis **30**. The first guide means **40** is fixed on the hollow body **10** at the opening **11** thereof. Furthermore, it is noted that the first guide means **40** forms a component for closing the hollow body **10**, comprising a fluid. Also, to prevent any loss of fluid to the outside of the hollow body, the guide means **40** can accommodate one (as shown in FIG. **2**) or a plurality of O-rings **42** to ensure fluid-tightness between the inner wall of the hollow body **10** and the first guide means **40**. Similarly and for the same purpose, a seal **44** may be provided between the first guide means **40** and the axis **30** to prevent any fluid leakage.

In addition, in order to make it easier to guide the axis **30** in the guide means **40**, it is advantageous to provide a plain bearing **43** at the interface of the axis **30**/first guide means **40**.

The tensioner **100** comprises a second guide means **50** for said axis **30**. The second guide means **50** is in the form of a tube **50** that defines an inner volume VI wherein said axis **30** is intended to move and an outer volume VE that is outside said tube **50**, within the hollow body **10**.

The tube **50** is clamp-mounted on a seat **83** resting on the bottom **12** of the hollow body **10** and more precisely on a central zone **120** of this bottom **12**. More generally, the seat **83** is therefore mounted between an end **51** of the tube **50** and the bottom **12** of the hollow body **10**.

In fact, the bottom **12** comprises a central zone **120**, a peripheral zone **121** that is raised relative to the central zone **120** and an intermediate zone **122** connecting the central zone **120** to the peripheral zone **121**.

The seat **83** has a dimension d_1, taken radially and at said at least one fluid communication channel **90**, that is smaller than the dimension d_2, also taken radially, of the central zone **120** of the bottom **12** of the hollow body **10**. This allows a non-zero distance d to be defined between a channel opening **90** and a cup **124**. The cup **124** therefore broadly matches the shape of the intermediate zone **122** and the periphery zone **121** of the bottom **12**. Furthermore, the seat **83** comprises, in the lower part, a base **831** that is in contact with the central zone **120** of the bottom **12** of the hollow body **10**. The width (diameter) of this base **831** is strictly between d_1 and d_2.

"Radially" should be understood, throughout the description, to mean a direction perpendicular or substantially perpendicular to the longitudinal axis AL of the tensioner **100**.

The cup **124** is positioned at the bottom **12** of the hollow body **10**. This cup **124** more precisely comprises a first portion **124**A in front of the peripheral zone **121** of the bottom **12**, with a non-zero clearance J_A, and a second portion **124**B that is in front of the intermediate zone **122** and in contact with the seat **83**, and more precisely in contact with the base **831** of the seat **83**. The contact between the second portion **124**B of the cup **124** and the seat **83** is made possible at the base **831**. Furthermore, it is understood that the cup **124** rests on the base **831** of the seat **83**.

It is therefore understood that the cup **124** rests on the base **831** of the seat **83**, at the bottom **12** of the hollow body **10**.

Furthermore, and in general, the seat **83** advantageously has a maximum dimension d_3 (which corresponds to the dimension of the base **831**), taken radially, that is smaller than the dimension d_2 as defined above. The existence of a radial clearance J (d_2−d_3) enables self-centring between the tube **50** and the axis **30**.

The tensioner **100** comprises a cup **60** that is fixedly mounted on the axis **30** between the first guide means **40** of the axis **30** and the second guide means of the axis **30**, said second guide means being formed by the tube **50**.

The tensioner **100** further comprises an elastic return means **70** arranged around the tube **50** so that there is a non-zero distance D, taken radially, between the elastic return means **70** and the tube **50**. It should be noted that the elastic return means **70** is held between the two cups **60**, **124**.

The elastic return means **70** is advantageously, as shown in FIG. **2**, a helical spring.

The seat **83** is held axially by the contact with the cup **124**, the latter being subjected to the force exerted by the return means **70**. The compression of the elastic return means **70** on the cup **124** makes it possible to permanently keep the seat

83 in contact with the bottom **12**, in the central zone **120**. For this purpose, it is advantageous to provide a clearance between the cup **124** and the peripheral zone **121** of the bottom **12**.

Furthermore, the tensioner **100** comprises a valve **80** that is mounted at one end **51** (lower end) of the tube **50** and with which at least one fluid communication channel **90** is associated.

Advantageously, a plurality of fluid communication channels **90**, **91**, **92**, **93** are provided, as can be seen in FIG. **6**, which shows a section of FIG. **2**, in section A-A. In this case, the valve **80** opens onto a central orifice OC. All the fluid communication channels **90**, **91**, **92**, **93** distribute and converge in the central orifice OC.

The valve **80** will be described in more detail in the following part of the description.

Said at least one fluid communication channel **90** allows fluid contained in the hollow body **10** to pass between the outer volume VE that is outside the tube **50** and the inner volume VI of the tube **50**.

The elastic return means **70** is designed to bear on the cup **124**. This is consistent with the fact that there is a non-zero distance D separating, radially, the elastic return means **70** and the tube **50**. The tube **50** is in fact placed and held on the bottom **12** by means of the seat **83**, the latter being attached to the tube **50** at the upper end thereof.

Said at least one fluid communication channel **90** is arranged to open in front of the intermediate zone **122** at a non-zero distance d from this intermediate zone **122**. Said at least one fluid communication channel **90** therefore does not open, in the outer volume VE, in front of the elastic return means **70**. In operation, the flow of the fluid from the outer volume VE to the inner volume VI is therefore not at risk of being disturbed by the elastic return means **70**.

In an advantageous case and as shown in FIG. **2**, said at least one fluid communication channel **90** furthermore comprises a longitudinal axis which is arranged substantially radially, and advantageously radially, with reference to the tensioner **100**. In other words, said at least one fluid communication channel **90** comprises a longitudinal axis which is advantageously substantially perpendicular to the longitudinal axis of the tensioner **100**. In this case, it is possible to describe the absence of disturbance caused by the elastic return means **70** with the non-zero axial displacement A (that is, along the longitudinal axis of the tensioner **100**) between the longitudinal axis of said at least one fluid communication channel **90** and the bearing zone of the elastic return means **70** on the peripheral wall **121** of the bottom **12** of the hollow body **10**.

It will thus be understood that, in general, this arrangement (that is, the arrangement of the cup **124**, the elastic return means **70** and said at least one fluid communication channel **90** relative to a specifically defined bottom) makes it possible to obtain a region of the hollow body **10**, said region being defined around the tube **50** and at least up to said at least one communication channel **90**, and being free of any obstacle. In the case in point, this region is in the form of a fluid ring around the tube **50** (of thickness D) and extends up to the central zone **120** (thickness d at this level) of the bottom **12** of the hollow body **10**.

In the context of the invention, there is thus, particularly with respect to the operation of the tensioner proposed in document D1, a much more homogeneous, undisturbed flow during use, which improves the operation of the tensioner, particularly in expansion.

The tensioner according to the invention can be further improved.

A possible improvement concerns a second embodiment.

This second embodiment of a tensioner **100'** according to the invention is shown in FIG. **3**.

This tensioner **100'** is in all respects consistent with the tensioner **100** of FIG. **2**, but also has a sheath F.

The sheath F has an end F**1** resting on the cup **124**.

The elastic return means **70** then bears on this end F**1** of the sheath F.

The sheath F is also arranged around the tube **50** between the elastic return means **70** and the tube **50** at a non-zero distance D', taken radially, from the tube **50**. As a result, the region of the hollow body **10** that is free of any obstacle is defined between the sheath F and the tube **50** up to the at least one fluid communication channel **90**. It is understood from these comments that the distance D' is strictly smaller than the distance D.

In particular, it can be envisaged that the distance D' is equal to the distance d.

In a variant (not shown), it can be envisaged that the sheath F and the cup **124** only form a single piece. Furthermore, if the distance D' is equal to the distance d, then the inner diameter of this single piece will be constant over its entire height.

This avoids any risk that the fluid, because of its viscosity, is disturbed by the presence and movement of the elastic return means **70**, in particular at the outer wall of the tube **50**.

The operation of the tensioner **100'** can be specified using FIGS. **4**(*a*) and **4**(*b*).

FIG. **4**(*a*) is a longitudinal sectional view of the tensioner **100'**, in compression and more precisely in the maximum compression position. In this position, it is noted that the lower wall **62** of the cup **60** is in contact (abutment) with the end **52** (upper end) of the tube **50**, which is opposite to the end **51** (lower end). The axis **30** is then in contact with or near the valve **80** so that the inner volume VI is zero or almost zero. All the fluid contained in the hollow body **10** is therefore in the outer volume VE.

FIG. **4**(*b*) is a longitudinal sectional view of the tensioner **100'**, in expansion and more precisely in the maximum expansion position. In this position, it is noted that the first guide means **40** is in contact (abutment) with the cup **60**, more precisely with the upper wall **61** of the cup **60**. The inner volume VI is then filled to its maximum and the fluid is present both in the inner volume VI and the outer volume VE.

From the two FIGS. **4**(*a*) and **4**(*b*), the relative axial displacement between the hollow body **10** and the sleeve **20** is also noted.

The operation described above using FIGS. **4**(*a*) and **4**(*b*) for the second embodiment (FIG. **3**) is fully applicable to the first embodiment (FIG. **2**).

It is also possible to further improve the operation of the tensioner **100**, **100'**, whatever the embodiment, by correctly dimensioning the valve **80**.

With reference to FIG. **5**, the valve **80** comprises a closure member **81**, for example a ball, mounted on a dedicated elastic return means **82**, for example a spring.

The dedicated elastic return means **82** is fixed relative to the seat **83**. More precisely, in this FIG. **5**, the dedicated elastic return means **82** is fixedly mounted on a stop **84**, for the closure member **81**, which stop **84** is clamp-mounted on the seat **83**. This stop makes it possible to control the travel of the closure member **81**, which can have an impact on the proper operation of the tensioner.

It should be understood that the valve **80** described above for FIG. **5**, which is an enlarged view of FIG. **2** compared to the first embodiment, is applicable to the second embodiment (FIG. **3**) because the valve **80** is the same in both embodiments.

In an embodiment variant of the valve **80'**, shown in FIG. **7** on the basis of the second embodiment of FIG. **3**, the stop **84'** may be centred on the tube **50** and axially clamped to the tube **50** by the seat **83**. The stop **84'** then has the same function as the stop **84**.

This is only one assembly variant.

This does not change the functionality of the valve.

Furthermore, this embodiment variant is entirely applicable to the first embodiment (FIG. **2**).

The dedicated elastic return means **82** is generally prestressed to ensure that it exerts a permanent force, which is particularly useful at rest, to hold the closure member **81** against the seat **83**, which is attached to the tube **50** at the end **51** thereof. The seat **83** therefore belongs to the valve **80** and also serves, as indicated above, to make the connection between the end of the tube **50** and the central zone **120** of the bottom **12** of the hollow body **10**. This force depends on the stiffness k of the dedicated elastic return means **82**, but also the deformation thereof relative to its natural equilibrium position.

The valve **80** is then normally closed.

In the case of a ball **81** being used as closure member, a frustoconical seat **83** is particularly advantageous. It enables optimal cooperation with the ball **81**.

In use, the tensioner **100**, **100'** is confronted with a plurality of constraints.

From the rest position, if the tensioner **100**, **100'** is allowed to relax, it is advantageous to have a closure member, for example a ball **81**, which is relatively light. In fact, during the expansion, the depression in the inner volume VI of the tube **50** allows the fluid present in the outer volume VE to enter the inner volume VI and the lighter the ball, the higher the speed of this fluid transfer.

Similarly, during a compression, it is useful for the ball to also be light to ensure that the valve **80** and therefore the tube **50** close to respond as quickly as possible to the stress exerted and consequently to ensure a rapid rise in pressure in the inner volume VI.

However, it is also necessary to take into account the force exerted by the dedicated elastic return means **82** on the closure member **81**.

Here, the situation is not symmetrical depending on whether the tensioner **100**, **100'** is stressed in expansion or in compression.

In fact, in expansion, the presence of the dedicated elastic return means **82**, which allows a force to be exerted that pushes the closure member **81** against its seat **83**, is to be overcome (preload). It is therefore of the greatest interest to ensure that the tensioner **100**, **100'** responds rapidly to minimise the preload, which means minimising the stiffness k of dedicated elastic return means **82** and/or its positioning with respect to its natural equilibrium position.

On the contrary, in compression, it is of the greatest interest to provide a high preload because this promotes rapid closure of the valve **80**.

As far as the preload is concerned, the requirements for rapid response of the tensioner **100**, **100'** in both expansion and compression are therefore contradictory.

However, the Applicant found, surprisingly, that it was possible to find a useful compromise on the value of this preload to ensure that the valve **80** opens (expands) or closes (compresses) more quickly, with the understanding that this compromise on the preload is also dependent on the mass of the ball.

According to the Applicant, this ideal compromise can be achieved with:

- a closure member **81** with a mass of between 50 mg and 700 mg; and
- a preload of between 0.05 N and 0.4 N, in a direction so as to push the closure member **81** against the seat **83**.

In practice, it is in particular possible to use a dedicated elastic return means **82** having a stiffness of between 30 N.m. and 80 N.m. All that is then required is to adjust the position of the dedicated elastic return means **82** accordingly to obtain the desired preload. In particular, with a conventional spring, the spring is contracted, relative to its natural equilibrium position, by the appropriate value ΔX so that the product $k^*\Delta X$, which corresponds to the preload, is within the range of values indicated above.

It is also useful for the travel of the closure member **81** to be kept between two limit values. A minimum travel promotes the passage of fluid between the closure member **81** and the seat **83** during the expansion. On the other hand, a maximum travel prevents the closing time from being slowed down.

In practice, a travel of the closure member **81** of between 0.3 mm and 2.5 mm can be envisaged. In particular, a travel in the range of 1 mm can be envisaged. This makes it possible to improve the supply to the inner volume VI of the tube **50** and to close the same tube **50** correctly and more easily.

As indicated above, this travel can be controlled by the arrangement of the stop **84**, **84'**.

Furthermore, when a ball is used as a closure member **81**, it is useful for the seat **83** to have, in its inner portion, a frustoconical shape for cooperating with the ball **81**. In this case, the angle α of the cone (see FIG. **5** or FIG. **7**) is advantageously between 30° and 90°, in particular about 60°.

Finally, it should be noted that the choice of the working fluid in the tensioner **100**, **100'** can also have an impact on the operation of the tensioner.

In practice, an oil can be used as the working fluid in the tensioner **100**, **100'**.

Advantageously, this chosen oil will have a grade chosen from the grades between ISO VG5 and ISO VG150, which are defined by a kinematic viscosity according to the ISO3448 standard. Advantageously, grades ranging from ISO VG10 to ISO VG46 will be selected. These grades allow the tensioner to operate properly within the response time and under the most severe thermomechanical conditions.

The invention claimed is:

1. A tensioner with a longitudinal axis, comprising:

- a hollow body provided with an opening and a bottom, the hollow body comprising a fluid;
- a sleeve arranged around the hollow body,
- an axis,
- a first guide means for said axis, this first guide means being attached to the hollow body at the opening thereof;
- a second guide means for said axis, this second guide means being in the form of a tube that defines an inner volume wherein said axis is intended to move and an outer volume that is outside said second guide means within the hollow body;
- a first cup fixedly mounted on said axis between the first and second guide means of said axis;
- a second cup mounted at the bottom;
- an elastic return means arranged around the second guide means so that there is a non-zero distance, taken

radially, between the elastic return means and the second guide means, said elastic return means being held between the first cup and the second cup;

a valve comprising a seat mounted between one end of the second guide means and the bottom of the hollow body, at least one fluid communication channel is associated with said valve to allow the passage of a fluid contained in the hollow body between the outer volume of the second guide means and the inner volume of said second guide means; said bottom comprises

a central zone, a peripheral zone that is raised relative to the central zone and an intermediate zone connecting the central zone to the peripheral zone;

the second cup comprises a first portion in front of the peripheral zone and a second portion that is in front of the intermediate zone and is in contact with a base of the seat, this base itself being in contact with the central zone;

the elastic return means is designed to bear on the first portion of the second cup;

said at least one fluid communication channel is arranged to open in front of the second portion of the second cup at a non-zero distance from this second portion, this arrangement allowing a fluid region of the hollow body to be defined around the second guide means up to said at least communication channel, said fluid region being free of any obstacle.

2. The tensioner according to claim **1**, wherein the sleeve is movably mounted relative to the hollow body and the axis is fixedly mounted relative to the sleeve.

3. The tensioner according to claim **1**, wherein a sheath is provided, one end of which is in contact with the first portion of the second cup, the elastic return means then bearing on this end of the sheath, the sheath being furthermore arranged around the second guide means between the elastic return means and the second guide means at a non-zero distance, taken radially, from the second guide means, so that said fluid region of the hollow body that is free of any obstacle is defined between the sheath and the second guide means up to said at least one fluid communication channel.

4. The tensioner according to claim **1**, wherein the elastic return means is a helical spring.

5. The tensioner according to claim **1**, wherein the base of the seat has a dimension, taken radially, that is strictly smaller than a dimension, also taken radially, of the central zone of the bottom of the hollow body, so that there is a clearance between the seat and the intermediate zone.

6. The tensioner according to claim **1**, wherein the valve further comprises:

a dedicated elastic return means that is fixed relative to the base; and

a closure member that is attached to the dedicated elastic return means and rests on the seat.

7. The tensioner according to claim **6**, wherein the closure member has a mass of between 50 mg and 700 mg and wherein the dedicated elastic return means is designed to apply a preload of between 0.05 N and 0.4 N in a direction so as to push the closure member against the seat.

8. The tensioner according to claim **7**, wherein the dedicated elastic return means has a stiffness k of between 30 N.m. and 80 N.m.

9. The tensioner according to claim **6**, wherein, the closure member being a ball, the seat comprises a frustoconical inner portion for cooperating with the ball, this frustoconical inner portion being defined by an angle of between 30° and 90°.

10. The tensioner according to claim **1**, wherein the valve comprises a stop designed to control the travel of the closure member.

11. The tensioner according to claim **10**, wherein the travel of the closure member is between 0.3 mm and 2.5 mm.

12. The tensioner according to claim **1**, wherein the fluid contained in the hollow body is an oil.

13. The tensioner according to claim **12**, wherein the oil has a grade defined between the ISO VG5 standard and the ISO VG150 standard, these standards being defined by a kinematic viscosity according to the ISO 3448 standard.

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